PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

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Applicant's or agent's file reference	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
30A-89 123		
International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/EP 02/10888	27.09.2002	27.09.2002

International Patent Classification (IPC) or both national classification and IPC
H04B1/707

Applicant
TELEFONAKTIEBOLAGET LM ERICSSON (PUBL) et al.

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 3 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the opinion
   - II ☐ Priority
   - III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
31.03.2004	21.02.2005

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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/EP 02/10888

I. Basis of the report

1. With regard to the **elements** of the international application *(Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17))*:

Description, Pages

1-15 as originally filed

Claims, Numbers

1-18 received on 24.09.2004 with letter of 24.09.2004

Drawings, Sheets

1/7-7/7 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:
- ☐ the drawings, sheets:

5. ☒ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

see separate sheet

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-18
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-18
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations

see separate sheet

Re Item I
Basis of the report

1 The amendments filed with the letter dated 24.09.2004 introduce subject-matter which extends beyond the content of the application as filed, contrary to Article 34(2)(b) PCT.

2 The amendments concerned are the following:
Claims 1 and 16 are defined amongst others by a *previous power relationship*. There is no basis therefor in the application as filed.

3 The amendment was introduced to overcome an objection made by the International Preliminary Examining Authority.

4 In the application as filed the term *original power relationship* was used. Initially the term was found to be unclear. However, after reconsideration of the application as a whole, the International Preliminary Examining Authority finds that although the term is ambiguous, it does not hinder the International Preliminary Examining Authority in establishing a reasoned statement with regard to novelty, inventive step or industrial applicability

5 The reasoned statement with regard to novelty, inventive step or industrial applicability is therefore drawn up for claims in which the particular amendment was not made (Rule 70.2(c) PCT).

Re Item V
Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

6 Reference is made to the following document:

D1: WO 01/78269 A (SAMSUNG ELECTRONICS CO LTD) 18 October 2001

7 The document D1 is regarded as being the closest prior art to the subject-matter of claim 1, and discloses (the references in parentheses applying to this document): A method of evaluating a code which is orthogonal to one or more further codes, comprising the steps of:

- receiving a signal which carries a code containing a sequence of code symbols;

8 The subject-matter of claim 1 therefore differs from this known method in that it further comprises the features:

- determining for a code symbol at a particular symbol instant at least one channel estimate;
- determining for the code symbol a compensation value taking into account the at least one channel estimate;
- compensating each code symbol using the compensation value determined for the corresponding symbol instant; wherein the compensation is performed such that an original power relationship among the individual code symbols contained in the code is restored; and
- evaluating the code on the basis of the sequence of compensated code symbols exploiting the orthogonailty to the further codes.

9 The subject-matter of claim 1 is therefore novel (Article 33(2) PCT).

10 The problem to be solved by the present invention may therefore be regarded as how to provide a more accurate detection when the channel is fluctuating rapidly.

11 The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

12 In document D1 the despread symbols are accumulated and the compensation for the channel is done on the bulk of accumulated symbols. D1 does not suggest to handle the symbols on a symbol-by-symbol basis.

13 None of the other documents availble suggest a symbol-by-symbol compensation of the despread symbols.

14 Claim 16 relates to a receiver comprising means corresponding to the steps of the method of claim 1 and therefore claim 16 also meets the requirements of the PCT with respect to novelty and inventive step.

15 Claims 2-15 resp. 17-18 are dependent on claims 1 resp. 16 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

Claims

1. A method of evaluating a code which is orthogonal to one or more further codes, comprising the steps of:
   - receiving a signal which carries a code containing a sequence of code symbols;
   - determining for a code symbol at a particular symbol instant at least one channel estimate;
   - determining for the code symbol a compensation value taking into account the at least one channel estimate;
   - restoring a previous power relationship among the individual code symbols contained in the code by compensating each code symbol using the compensation value determined for the corresponding symbol instant; and
   - evaluating the code on the basis of the sequence of compensated code symbols exploiting the orthogonality to the further codes.

2. The method of claim 1, wherein the step of evaluating the code comprises determining if the received code is identical with a known code and/or which code out of a predefined set of orthogonal codes has been received.

3. The method of claim 1 or 2, wherein the step of evaluating the code comprises associating the sequence of compensated code symbols with one or more known sequences of code symbols.

4. The method of one of claims 1 to 3, wherein the signal carrying the code is received via multiple propagation paths, wherein for the particular symbol instant individual channel estimates for at least two propagation paths are determined and wherein the compensation value for the particular symbol instant is determined taking into account the individual channel estimates determined for this symbol instant.

5. The method of claim 4, wherein in the compensation value weak propagation paths are considered with a lower significance than strong propagation paths.

6. The method of one of claims 1 to 5, wherein the compensation value is constituted by a compensation factor $c[k]$ which is calculated for a specific symbol instant k according to

$$c[k] = \frac{1}{\sum_{l=1}^{L} a_l \cdot \left|\hat{g}_l[k]\right|^2},$$

where L is the number of propagation paths to be taken into account, a_l is a weighting factor for an individual propagation path l, and $\hat{g}_l[k]$ is the channel estimate for propagation path l.

7. The method of one of claims 1 to 6, wherein the code is used in an access signaling context to identify or address a particular network component requesting access to a network resource.

8. The method of one of claims 1 to 7, wherein the code is transmitted via a first channel and wherein the channel estimates are determined on the basis of information transmitted via a second channel which is different from the first channel.

9. The method of claim 8, wherein the code transmitted via the first channel is used in a random access signaling context and/or wherein the second channel is used for transmitting signals carrying information that is known at a receiving side.

10. The method of one of claims 1 to 9, wherein the step of determining channel estimates comprises averaging for a specific propagation path each channel estimate over a number of symbol instants.

11. The method of one of claims 1 to 10, wherein the step of determining channel estimates comprises a Doppler shift adaptation of the channel estimates.

12. The method of one of claims 1 to 11, wherein the step of evaluating the code comprises a comparison with a threshold.

13. The method of claim 12, wherein the threshold is determined on the basis of a ratio between a power level used on an access signaling channel and a power level used on a channel for pilot transmission.

14. A computer program product comprising program code portions for performing the steps of one of claims 1 to 13.

15. The computer program product of claim 14, stored on a computer readable recording medium.

16. A receiver (20) for receiving a signal carrying a code which contains a sequence of code symbols and which is orthogonal to one or more further codes, comprising:
- an estimator (26) for determining for a code symbol at a particular symbol instant at least one channel estimate;
- a compensator (30) to restore a previous power relationship among the individual code symbols contained in the code by determining for the code symbol a compensation value taking into account the at least one channel estimate and for compensating each code symbol using the compensation value determined for the corresponding symbol instant; and
- an evaluator (32) for evaluating the code on the basis of the sequence of compensated code symbols exploiting the orthogonality to the further codes.

17. The device of claim 16, wherein the receiver (20) is configured as a RAKE receiver.

18. The device of claim 17, wherein the compensator (30) is configured to generate a maximum ratio combined output signal (AI_MRC).